Subnetting

Overview

A subnet or subnet can be a network within the network. Subnets make the web more efficient. Through subnetting, network traffic can be transmitted over a shorter distance without going through unnecessary routers to reach the destination successfully. Imagine that Alice mails a letter to Bob, who lives in a small town near her home. For Bob to receive the letter as soon as possible, it must be sent from Alice's post office to Bob's city post office, and then to Bob. If the letter were first sent to a post office a few miles away, it could take longer for Alice's letter to succeed Bob. Like mail, the network will be more efficient when the message is spread as directly as possible. When a network receives data packets from another web, it classifies and routes these data packets by subnet so that the data packets do not reach the destination through inefficient routes.

When the IP system was first introduced, it quickly became apparent that although it is now much easier to find the selected network, it is now also challenging to send the knowledge packet to the machine you want to be on the web. This becomes especially obvious when the network becomes large enough to support a business because network performance becomes more significant. Subnets help solve this problem by dividing the network into smaller parts, reducing congestion. The data packet is ready to flow to the destination and avoid human bottlenecks. For logical reasons (firewalls, etc.) or physical requirements (smaller broadcast domains, etc.), companies can use IP subnets to divide more extensive networks. In other words, routers use subnets to form routing options.

The purpose of subnetting

Consider the number of assignable IP addresses in the various IP address categories shown in Table 1. Remember that the host bits of an IP address cannot be all zeros (representing a network address) or all ones (representing a directed broadcast address). Therefore, the number of IP addresses that who can assign in a subnet is generally determined by the following formula, where h is the number of host bits during the subnet mask:

Number of IP addresses that can be assigned during the subnet = $2^h - 2$,

Address Class	Assignable IP Addresses
Class A	16,777,214 ($2^{24} - 2$)
Class B	65,534 ($2^{16} - 2$)
Class C	254 ($2^8 - 2$)

Table 1: Assignable IP Addresses

Suppose you decide to use a class B private IP address (for example, 172.16.0.0/16) as your internal IP address. For performance reasons, you may not want to support up to 65,534 hosts in a single broadcast domain. Therefore, the best practice is to use this network address and subnet the network (thus expanding the number of network bits in the network subnet mask) to other subnets.

Calculate the number of subnets created

To determine the number of subnets created by adding bits to the classful mask, you can use the following formula, where s is the number of bits rendered:

Number of subnets made = 2^s

For example, Suppose you use a 28-bit subnet mask to subnet the 192.168.1.0 network, and you want to calculate the percentage of subnets created. First, determine the percentage of borrowed bits that you have acquired. Remember that the number of bits rendered is the number of bits that exceed the classful mask during the subnet mask. In this case, because the value of the leading octet in the network address is 192, you will conclude that this is usually a class C network. Also, as you may recall, a class C network has 24 bits in its subnet mask with class (that is, default). Because you now have a 28-bit subnet mask, the number of rendered bits is generally calculated as follows:

number of borrowed bits = bits in a custom subnet mask-bits in a classful subnet mask

number Borrowed bits = 28 - 24 = 4

Now, if you only know you have four borrowed places, you will increase the install from 2 to 4 (2^4, or 2 * 2 * 2 * 2), which equals 16. Based on this calculation, you can conclude that dividing into 192.168.1.0/24 subnets with a 28-bit subnet mask results in 16 subnets.

Calculate the number of obtainable hosts

Suppose you want to calculate the number of available hosts IP addresses in one of the 192.168.1.0/28 subnets. First, you need to calculate the number of host bits in the subnet mask. Since it recognizes that the IPv4 address consists of 32 bits, it will subtract the number of bits in the subnet mask (28 in this example) from 32 to calculate the number of host bits:

host bits = 32-host bits Count the number of bits in the subnet mask
number of bits in the host = 32-28 = 4

Now you only know the number of host bits. You will apply it to the above formula, where h is the number of host bits in the subnet mask:

The number of IP addresses that can be allocated in the subnet = 2^h-2
The number of IP addresses that can be allocated in the subnet = 24-2 = 16-2 = 14

Through this calculation, you will conclude that 192,168.1.0 / 28 Each of these subnets has 14 available IP addresses.

Host Bit	Supported Hosts
2	2
3	6
4	14
5	30
6	62
7	126
8	254
9	510

10	1022
11	2046
12	4094

Table 2: The number of hosts supported by a given number of specific host bits

Figuring New IP Address Ranges

Since you basically can figure the number of subnets made upheld a given number of acquired pieces, the ensuing coherent advance is to compute the IP address ranges making up those subnets. for instance, on the off chance that you took the 172.25.0.0/16 and subnetted it with a 24-bit subnet veil, the subsequent subnets would be as per the following:

172.25.0.0/24
172.25.1.0/24
172.25.2.0/24
...
172.25.255.0/24

Let's consider how such a calculation is performed. Notice in the previous example that you count by 1 in the third octet to calculate the new networks. To determine in what octet you start counting and by want increment you count, a new term needs to be defined. The interesting octet is the octet containing the last 1 in the subnet mask.

Example:

A 27-bit subnet veil is applied to an organization address of 192.168.10.0/24. To compute the made subnets, you'll play out the ensuing advances:

1. The subnet cover (in parallel) is 11111111.11111111.11111111.11100000. The intriguing octet is the fourth octet on the grounds that the fourth octet contains the final remaining one inside the subnet.
2. The decimal worth of the fourth octet inside the subnet veil is 224 (11100000 in decimal). Along these lines, the square size is 32 (256 – 224 = 32).
3. The first subnet is 192.168.10.0/27 (the worth of the principal 192.168.10.0 organization with the acquired pieces [the initial three pieces inside the fourth octet] set to 0).
4. Tallying by 32 inside the intriguing octet (the fourth octet) permits you to ascertain the excess subnets:

192.168.10.0
192.168.10.32
192.168.10.64
192.168.10.96
192.168.10.128
192.168.10.160
192.168.10.192
192.168.10.224

Since you know the subnets made from a classful organization given a subnet cover, an ensuing consistent advance is to work out the usable addresses inside those subnets. Review that you can't dole out an IP address to a device if all the host bits inside the IP address are set to 0 on the grounds that an IP address with all host bits set to 0 is that the location of the subnet itself. Also, you can't appoint an IP address to a device if all the host bits inside the IP address are set to 1 on the grounds that an IP address with all host bits set to 1 is the coordinated transmission address of a subnet. By barring the organization and coordinated transmission addresses from the 192.168.10.0/27 subnets (as recently determined), the usable addresses are displayed in Table 3 not really settled.

Subnet Address	Directed Broadcast Address	Usable IP Addresses
192.168.10.0	192.168.10.31	192.168.10.1–192.168.10.30
192.168.10.32	192.168.10.63	92.168.10.33–192.168.10.62
192.168.10.64	192.168.10.95	192.168.10.65–192.168.10.94
192.168.10.96	192.168.10.127	192.168.10.97–192.168.10.126
192.168.10.128	192.168.10.159	192.168.10.129–192.168.10.158
192.168.10.160	192.168.10.159	192.168.10.161–192.168.10.190
192.168.10.192	192.168.10.223	192.168.10.193–192.168.10.222
192.168.10.224	192.168.10.255	192.168.10.225–192.168.10.254

Table 3: Usable IP Address Ranges for the 192.168.10.0/27 Subnets